

The Utility of Intraoperative Handheld Gamma Camera for Detection of Sentinel Lymph Nodes in Melanoma

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Abstract Accurate identification of the sentinel lymph node (SLN) is an important prognostic factor for melanoma. In a minority of cases drainage to interval nodal basins, such as the epitrochlear region, are possible. Intraoperative handheld gamma cameras have been used to detect SLNs which are located in different anatomical localizations. In this case we report the utility of an intraoperative handheld gamma camera in the localization of epitrochlear drainage of distal upper extremity melanoma and its impact on surgical procedure.

Keywords Melanoma · Handheld gamma camera · Radionuclide imaging · Sentinel lymph node biopsy

Introduction

Identification of lymph node metastasis is an important prognostic factor for melanoma [1]. For this purpose, preoperative lymphoscintigraphy and intraoperative gamma probe are helpful procedures for localizing the sentinel lymph node (SLN) [2, 3]. SLN is mostly located in the cervical, axillary, or inguinal basin. However in a minority of cases (5–8 %) drainage is seen to the interval nodal basin that exists between the primary melanoma location and its regional nodes. These interval nodal basins can be listed as the intermuscular triangle space on the back, the popliteal fossa, or the epitrochlear

region. Epitrochlear drainage has been reported in cases of distal upper extremity melanoma [4–7].

Recently, there has been development of an intraoperative handheld gamma camera which has real-time images of radioactive tissues and SLNs [8]. Short source-to-detector distances, minimal overlying tissue and a larger field of view than that of gamma probes allows more rapid examination of large areas and easier reassessment of the surgical area [9, 10]. In the literature, intraoperative handheld gamma cameras have been used in different anatomical localizations in the detection of SLNs, predominantly in breast cancer, but also in melanoma, in urological and gynecological malignancies [11–13].

We report the utility of an intraoperative handheld gamma camera in the localization of epitrochlear drainage of distal upper extremity melanoma and its impact on surgical procedure.

Case Report

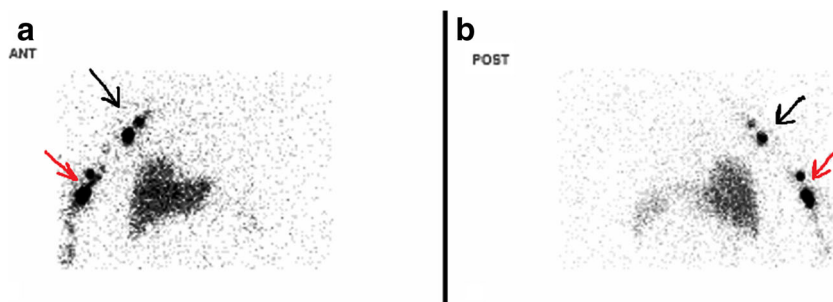
A 59-year-old woman noted a brown ulcerated lesion on the distal phalanx of her right ring finger. An excisional biopsy was performed at another hospital. Histopathological examination revealed a nodular melanoma (Clark level V) with a measured depth of 4 mm. Immunohistochemical staining was performed and the tumor cells were positive for S-100 and HMB-45. She was referred to our hospital for advanced treatment. The patient underwent lymphoscintigraphy for identification of the lymphatic mapping. Twenty megabecquerels of Tc-99m nanocolloid was injected intradermally around the lesion site which localized in the her right ring finger. Fifteen minutes later from injection, anterior and posterior static images (Fig. 1) were taken from thoracal region by dual headed gamma camera (Siemens ECAM; Siemens Healthcare, Erlangen, Germany).

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Fig. 1 Anterior (a) and posterior (b) static images from the thoracic region were taken by dual-headed gamma camera. Axillary (black arrow) and epitrochlear (red arrow) lymphatic drainage was seen on the right upper extremity



In these images, epitrochlear and axillary drainage were detected in the right upper extremity. On the operation day, 1 h prior to surgery, 20 MBq Tc-99m nanocolloid was reinjected intradermally around the lesion site and these regions (axillary and epitrochlear) were easily scanned by a new handheld gamma camera (CrystalCam; Crystal Photonics, Berlin, Germany) in a short time (Fig. 2) at the Department of Nuclear Medicine. In the operating room, the right elbow was again scanned and activity accumulation was detected by the intraoperative handheld gamma camera in the four focus (Fig. 3). Thereafter, epitrochlear lymph node dissection was easily applied under the guidance of the intraoperative handheld gamma camera (Fig. 4). After the dissection, no activity was detected. The patient also underwent the right axillary dissection and ring distal phalanx amputation. Pathological examination confirmed that four epitrochlear lymph nodes had melanoma metastases

as exhibited by intraoperative handheld gamma camera during surgery. Metastatic axillary lymph node was also confirmed by histopathologically.

Discussion

In literature, the incidence of epitrochlear sentinel node for distal upper extremity melanoma has been reported as 3.7–14.9 % [4–7]. Despite this relatively low incidence, correct identification of these interval nodes is important because of metastatic potential. Kidner et al. [7] stated that interval SLNs contain metastatic disease at the same frequency as seen in other major lymphatic basins and recommended that all patients with positive epitrochlear SLN should undergo complete axillary and epitrochlear dissection.

Nowadays, preoperative lymphoscintigraphy and intraoperative imaging techniques, such as gamma probe and handheld gamma camera, allow the surgeon to identify all basins at risk of metastatic disease and the location of the sentinel node. A portable mini gamma camera also provides real-time imaging of radioactive tissues. In the current case, epitrochlear and axillary drainage was detected by preoperative



Fig. 2 Picture of the intraoperative handheld gamma camera (CrystalCam, Crystal Photonics-Germany)

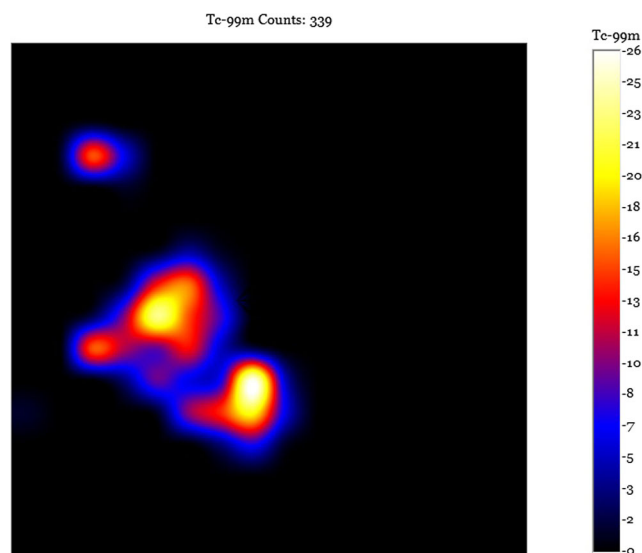


Fig. 3 Activity accumulation was detected by the intraoperative handheld gamma camera on the epitrochlear region in four foci

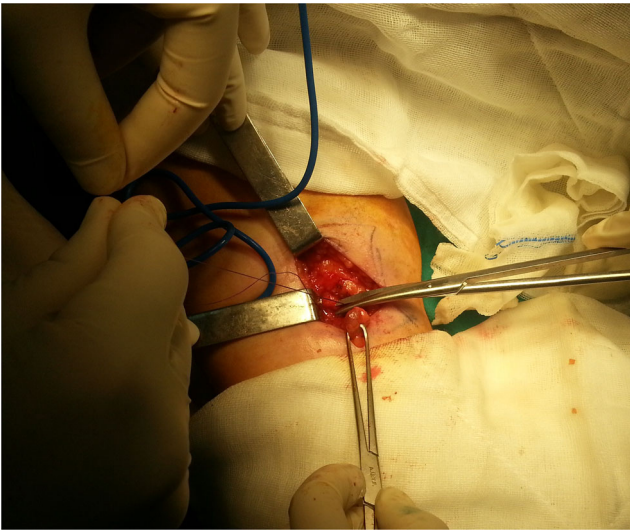


Fig. 4 Epitrochlear lymph node dissection

lymphoscintigraphy. In addition, these regions were scanned with a handheld gamma camera in the operating room. On the epitrochlear region, activity accumulation was clearly detected by handheld gamma camera in the four focus. After the dissection of epitrochlear lymph nodes, metastatic spread was confirmed by pathological examination. The patient also underwent axillary dissection because of metastatic interval nodes. Axillary metastasis was also confirmed by histopathologically in one lymph node. In this case, dissection of epitrochlear lymph nodes was easily performed under the guidance of the intraoperative handheld gamma camera. The use of a handheld gamma camera can therefore be recommended both for SLN biopsy and interval lymph node dissection in patients with melanoma.

Conflict of Interest Elgin Ozkan and Aydan Eroglu declare that they have no conflict of interest.

Ethical Statement This case report has been prepared in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All subjects in the study gave written informed consent.

This manuscript has been approved by authors and the manuscript has not been published before.

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